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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,212	11/17/2003	J. Christian Swindal	1857.2020000	2451

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EXAMINER	
DETSCHEL, MARISSA	
ART UNIT	PAPER NUMBER
2877	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	01/18/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 01/18/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

fadkt@skgf.com

Office Action Summary	Application No.	Applicant(s)	
	10/713,212	SWINDAL, J. CHRISTIAN	
	Examiner	Art Unit	
	Marissa J. Detschel	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on December 5, 2006 has been entered.

Information Disclosure Statement

The information disclosure statement filed on December 5, 2006, has been fully considered by the Examiner.

Claim Objections

Claim 25 is objected to because of the following informalities:

As to claim 25, the phrase "the coherence length of the light beam is less than a smallest thickness of one of the lenses in the lens." should read "wherein the coherence length of the light beam is less than a smallest thickness of one of the lenses in the lens system."

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 14-16, 18-21, and 23-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Osawa et al. (USPN 5,155,370).

Regarding claim 14, Osawa discloses a position determining system in an exposure portion of a photolithography tool that measures a position of a pattern on a substrate before a subsequent pattern is exposed, the system comprising:

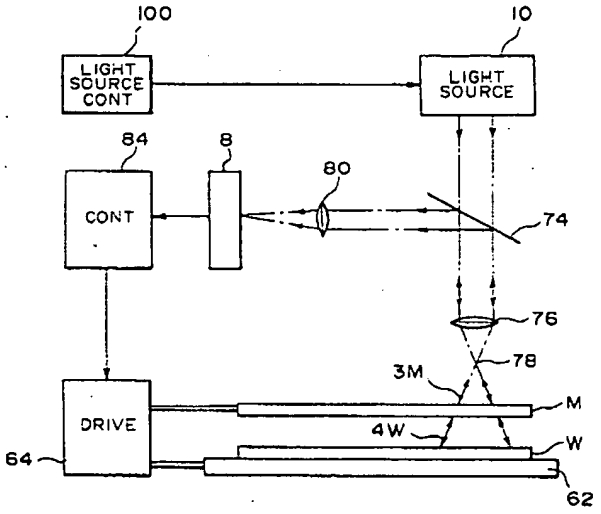

FIG. 1A

A superluminescent device (SLD) that transmits a light beam;

Light is sent from a source (10) and through a half mirror (74) to be sent to a mask/wafer alignment system in an exposure apparatus. In one embodiment of the invention, the light source is a super luminescent diode, which is a type of superluminescent device. (column 9, line 64-66)

A lens system that directs the light beam onto a target alignment area;

Light is focused at a point (78) by a condensing lens (76). The light illuminates a mask alignment pattern (3M) on a mask (M) and a wafer alignment pattern (4W) on a wafer (4). (column 3, lines 28-34)

A sensor that receives combined coherent beams of light diffracted by the target alignment area via the lens system, the sensor configured to use the combined coherent beams of diffracted light to determine a position of the target alignment area before the subsequent pattern is exposed and to produce a control signal related to the determined position; and

Light reflects from the alignment marks and is gathered by lens (78) and another lens (80) and sent to a detector (8). This sensor gathers information about the deviation in position of the two spots formed by the two subsequent alignment marks. (column 3, lines 34-39) The light beams diffract off the alignment marks (Figure 1B). (column 3, lines 46-59)

A positioning system configured to align the substrate to receive the subsequent pattern based on the control signal;

An output from the detector (8) is sent to a control circuit (84) which actuates a driving mechanism (64) to align the mask and the wafer. (column 3, lines 40-42)

Wherein the SLD is configured to produce a coherence length of the light beam that is less than a thickness of a lens in the lens system or less than a distance between lenses within the lens system.

The coherence length of the SLD used is 60 microns (column 10, lines 13-18). The distance between the two lenses (76 and 80) of the lens system is greater than 60 microns, as can be seen in the figure above. Furthermore, if the lens was of a thickness of greater than the coherence length of the light beam, the beam would spread out more upon being sent through the lens to the alignment marks, introducing a decrease in signal to noise ratio of the light beams. (column 6, lines 51-63)

In regards to claim 15, the SLD is configured to produce the coherence length of the light beam that substantially eliminates interference between at least one of ghost or spurious reflections caused by the lens system and the diffracted light beam. Typically, light from a source passing through and reflected by alignment patterns on a mask and a wafer have diffraction light (47") from the mask alignment pattern that interferes with the alignment signal light (47'), as shown in Figure 2 below. (column 4, lines 31-39)

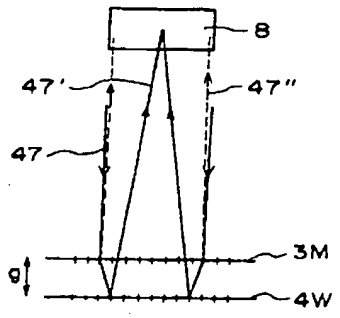

FIG. 2

The interference signal from the superposing of the unwanted diffraction light (47") and the alignment signal light (47') is illustrated below in Figure 3B. This signal shows a lot of randomly changing interference noise. (column 3, lines 46-51) This unwanted diffraction light represents ghost or spurious reflections.

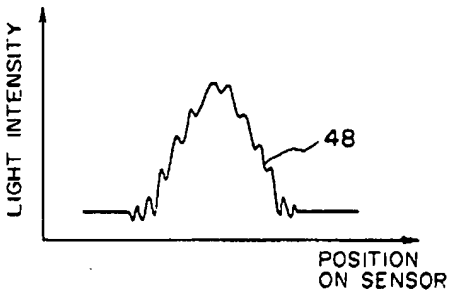

FIG. 3B

In order to get rid of this noise, both the signal and the unwanted light have to be completely incoherent (i.e. the degree of coherency of the beams diffracted from the mask alignment mark and the wafer alignment mark is zero). The interference pattern resulting from this is illustrated below in Figure 3C. (column 5, lines 55-64)

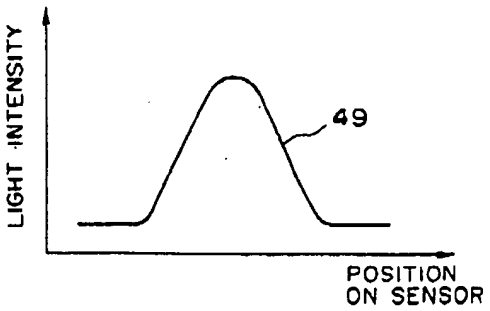

FIG. 3C

Coherence length *lc* of any light beam is given by the relation:

$lc = \lambda^2/\Delta\lambda$,

wherein λ is the wavelength of the light and $\Delta\lambda$ is the spectral width (i.e. full width at half maximum). Also, the condition under which reflection lights from the mask and the wafer do not interfere with each other is that the coherence length is less than or equal to twice the optical path length or the spacing between the mask and the wafer, *g*. Therefore, through an arrangement of the relation given above, the condition necessary for preventing interference is that the spectral width of the light beam is greater than or equal to $\lambda^2/2g$. Therefore, a broader spectral width and a shorter wavelength prevent interference better. (column 6, lines 3-30) This translates to a very low coherence length, and, therefore, this very low coherence length is chosen to eliminate the ghost or spurious reflections.

Regarding claim 16, the SLD is configured to produce a coherence length of the light beam that is less than a smallest distance between first and second ones of the lenses in the lens system. The coherence length of the SLD used is 60 microns (column 10, lines 13-18). The distance between the two lenses (76 and 80) of the lens system is greater than 60 microns.

Regarding claim 18, the sensor is configured to determine the position of the target alignment area using interferometry. The intensity of the interference pattern of the invention is illustrated in Figure 3C above. (column 4, lines 43-45)

Regarding claim 19, the SLD is configured to produce the coherence length of the light beam that is about 0.5 mm or less. The coherence length of the SLD is 60 microns. (column 10, lines 13-18)

In regards to claim 20, Osawa discloses a position measuring method that measures a position of a current position on a substrate before a subsequent pattern is exposed, comprising:

Generating superluminescent light having a coherence length;

Light is sent from a source (10) and through a half mirror (74) to be sent to a mask/wafer alignment system in an exposure apparatus. In one embodiment of the invention, the light source is a super luminescent diode, which is a type of superluminescent device. (column 9, line 64-66)

Directing the superluminescent light onto a target alignment area using a lens system;

Light is focused at a point (78) by a condensing lens (76). The light illuminates a mask alignment pattern (3M) on a mask (M) and a wafer alignment pattern (4W) on a wafer (4). (column 3, lines 28-34)

Diffracting superluminescent light from the target alignment area to produce +/- first order diffracted beams;

Directing the +/- first order diffracted beams onto a combining element using the lens system;

Combining the +/- first order diffracted beams using the combining element; and Determining a position of the target alignment area based on an interference pattern generated from the combining step;

Light reflects from the alignment marks and is gathered by lens (78) and another lens (80) and sent to a sensor (8). This sensor gathers information about the deviation in position of the two spots formed by the two subsequent alignment marks. (column 3, lines 34-39) The sensor represents a combining element, since this is where the two signals are gathered and combined to create a signal about the positional deviation between the alignment of the mask and the wafer. The light beams diffract off the alignment marks (Figure 1B and 3C). (column 3, lines 46-68) These diffracted light beams would include +/- first order diffracted beams.

Generating a control signal based on the determined position; and Positioning the substrate to properly align the substrate to receive the subsequent pattern based on the control signal;

An output from the detector (8) is sent to a control circuit (84) which actuates a driving mechanism (64) to align the mask and the wafer. (column 3, lines 40-42)

Wherein the coherence length of the superluminescent light is less than a thickness of a lens in the lens system or less than a distance between lenses within the lens system.

The coherence length of the SLD used is 60 microns (column 10, lines 13-18). The distance between the two lenses (76 and 80) of the lens system is greater than 60

microns, as can be seen in the figure above. Furthermore, if the lens was of a thickness of greater than the coherence length of the light beam, the beam would spread out more upon being sent through the lens to the alignment marks, introducing a decrease in signal to noise ratio of the light beams. (column 6, lines 51-63)

In regards to claim 21, the generating step comprises using a superluminescent device (SLD) to create superluminescent light. (column 9, line 64 to column 6, line 6)

Regarding claim 23, the coherence length of the superluminescent light is about 0.5 mm or less. The coherence length of the SLD is 60 microns. (column 10, lines 13-18)

In regards to claim 24, the coherence length of the light beam is less than a smallest distance between first and second ones of the lenses in the lens system. The coherence length of the SLD used is 60 microns (column 10, lines 13-18). The distance between the two lenses (76 and 80) of the lens system is greater than 60 microns.

Regarding claim 25, the coherence length of the light beam is less than a smallest thickness of one of the lenses in the lens system. If the lens was of a thickness of greater than the coherence length of the light beam, the beam would spread out more upon being sent through the lens to the alignment marks, introducing a decrease in signal to noise ratio of the light beams. (column 6, lines 51-63)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 17 and 22 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Osawa et al. (USPN 5,155,370) as applied to claims 14 and 20 above, and further in view of Alphone et al. (USPN 4,821,277).

Regarding claims 17 and 22, Osawa does not disclose the specifics of the SLD used in the system or method disclosed. Alphonse discloses a superluminescent device that presents the specifics behind the technology of the device. The SLD of Alphonse comprises a laser diode having at least one anti-reflective surface to generate the superluminescent light. (column 1, lines 45-47)

It would have been obvious to one or ordinary skill in the art at the time of the invention to use the SLD of Alphonse in the device and method of Osawa since the technology of the SLD presented is well known in the art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marissa J. Detschel whose telephone number is 571-272-2716. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

December 15, 2006
MJD

Gregory J. Toatley, Jr.
Supervisory Patent Examiner
22 Dec 06